EXPANDING DIMENSIONS OF HEAD INJURY

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Although traumatic brain injury is one of the commonest neurological disorders and a leading cause of disability (Levine, Kovacevic, Nice, Cheung, Gao, Schwartz, and Black, 2008) and indeed for a number of years the lay press has recognized the incidence of traumatic brain injury (e.g. Wall Street Journal: Klein, 1982) until recently traumatic brain injury has remained a widely unrecognized condition in medical and even neurological diagnostic settings (McCrea, 2008). Review of journals and professional meetings in neurology during the early years of this century reveals a striking paucity or even absence of papers addressing the subject. There are a number of reasons why traumatic brain injury, especially so called "mild" traumatic brain injury (MTBI) is frequently overlooked.

At injury site there may be no obvious loss of consciousness (Kelly and Rosenberg, 1997; Frangou, 2004) and in fact diagnostic criteria for mild traumatic brain injury do not require loss of consciousness for such a diagnosis to be made (e.g. American Congress of Rehabilitation Medicine; American Academy of Neurology, as cited by Ruff, 2009). If neuroradiological studies are conducted, the procedures most likely used have been repeatedly found to be "normal image" (Belanger, Vanderploeg, Curtiss and Warden, 2007). Further, a direct injury to the head is not necessary, since acceleration/deceleration forces (e.g. whiplash type injury; shaken baby syndrome) without the head striking anything can easily produce significant brain injury (e.g. Varney and Varney, 1995; Oberman, Bizewski, Maschke, Diener, and Katsarava, 2008). Finally, in the confusion of dealing with fractures, bleeding, and obvious physical problems, subtle signs of traumatic brain injury like confusion are easily overlooked (Hartlage and Patch, 2003). Then the symptoms of MTBI may be delayed (or not noted) for a time following the injury to the point where the victims or family members may not relate these symptoms to the injury (e.g. Hartlage, Wilson, and Patch, 2001). If the victim's family does not consider the precipitating event significant, they may not report it to the physician they consult some time after the event, and the physician may reasonably look for etiologies other than MTBI. Since longer term symptoms may include such factors as fatigue, depression, anxiety, concentration difficulties, insomnia, and irritability (World Health Organization, 1992), the patient with MBTI may be referred for mental health services, (e.g. Hoge, McGurk, Thomas, Cox, Engel, and Castro, 2008; Bryant, 2008). Recognition of MTBI is further complicated by the fact that, especially in combat related MTBI from improvised explosive devices (IEDs), MTBI may also be accompanied by posttraumatic stress disorder (PTSD): thus diagnostic focus may be on PTSD rather than MBTI.

For accurate diagnosis of MTBI a detailed evaluation including neuropsychological testing is necessary (Ling, Marshal, and Moore, 2010; Zasler, 1993), but such evaluation is rarely conducted in the large majority of MTBI cases. Specific incidence of traumatic brain injury thus is extremely difficult to identify. The 1.7 million annual figure in the United States frequently cited (e.g. Anderson-Barnes, Weeks, and Tsao, 2010) is based on hospital data, and thus represents only the most severe cases, and many MTBI patients do not seek medical care in a way directly related to the injury (McCrea, 2008). It is widely recognized that MTBI represents the large majority of traumatic brain injuries with estimates ranging from 75% (Center for Disease Control, 2003), to 95% (Hartlage, 1991).

A number of very comprehensive studies of injuries in discrete geographic loci indicate an annual incidence of potentially more than ten million new cases each year (Hartlage and Patch, 2003). Since incidence refers to injuries in a given time, (e.g. a year), the prevalence (i.e. number of cases with the injury) is dramatically higher: if ten million injuries each year, in a U.S. population of 350 million with life expectancy 70 years, each individual would be subject to two MBTIs in a lifetime. Given Rimel's classic and oft cited findings of up to 30% long term disability from minor head injury (Rimel, Giordani, and Barth, 1981), the cost is staggering. Unfortunately editors have eschewed citations of literature more than a few years old, so most of these earlier comprehensive studies have not been included in recent estimates.

Two factors have spurred a recent upsurge of interest in traumatic brain injury (Riechers, R.G. and Ruff, R.L., 2010) Sports Medicine has recognized concussive brain injury as a commonly occurring phenomenon, producing potentially catastrophic effects in venues ranging from neurobehavioral problems resultant from NFL head trauma to less violent sports like soccer. Since the literature on concussive injuries in sports settings is well covered in a number of publications and prominent international bodies have promulgated management guidelines (American Academy of Neurology, 1997; McCrory and Johnston, 2009), this paper will address the second factor involving improvised explosive device (IED) blast injuries. Brain injury from IEDs represents the leading cause of traumatic brain injury in the military population (Ling, Brandaky, and Armondo, 2010). Mild traumatic brain injury and posttraumatic stress disorder frequently co-occur in soldiers returning from Iraq and Afghanistan so much that together they have been referred to as "signature injuries" (Department of Defense, 2007; Jones, Young, and Leppman, 2010). Initial research suggests that damage to specific brain areas, e.g. the amygdala, is associated with greater (or lesser) risk of PTSD (Koenigs, Huey, and Grafman, 2007; Schuster, 2008). Longer term followup showed that, while fewer than 5% of soldiers surveyed reported with loss of consciousness, (LOC) 47% of them met criteria for PTSD while in the 10% with altered mental states but no LOC, only 27% had PTSD (Hoge et al, 2008). These findings, some months after returning home from deployment, tend to show more likelihood of poor general health, missed workdays, medical visits, and somatic symptoms among those with both MTBI and PTSD. Subsequent reviews, alone by the Institute of Medicine on even mild TBIs alone note that consequences may be more devastating than expected, with victims more likely to develop dementia, depression, epilepsy, and Parkinson's Disease. (Fallik, 2008). Currently military focused studies are investigating issues ranging from models to blast shock waves (Fallik, 2008) to etiologies in MTBI, to the role of unit cohesiveness in prevention of PTSD in combat exposure (Armistead-Jehle, Johnstad, Wade, and Eckland, 2011).

Broader studies of more refined neuroimageing to detect MTBI include perfusion computed tomography (Metting, Radiger, and Stewart, 2009); diffusion tensor imaging (Wilde, McCauley, and Hunter, 2008); and combined diffusion tensor imaging with magnetoencephalography (Valeo, 2008). Although hopefully newer neuroimaging procedures may enhance sensitivity for detecting MTBI, comprehensive neuropsychological testing will remain necessary for determining how MTBI affects a specific patient, for developing appropriate intervention strategies, and for making realistic plans for the patient's future.
This progressive interest in and attention to the widespread problem of traumatic brain injury offers encouragement and hope that in the future those suffering the multiple and diverse sequelae and symptoms of mild traumatic brain injury will not have to suffer the additional problems of having these sequelae and symptoms ignored and treated as something which can be overcome by will power and extra effort, or reflecting mental health problems.